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C1M MFT M422

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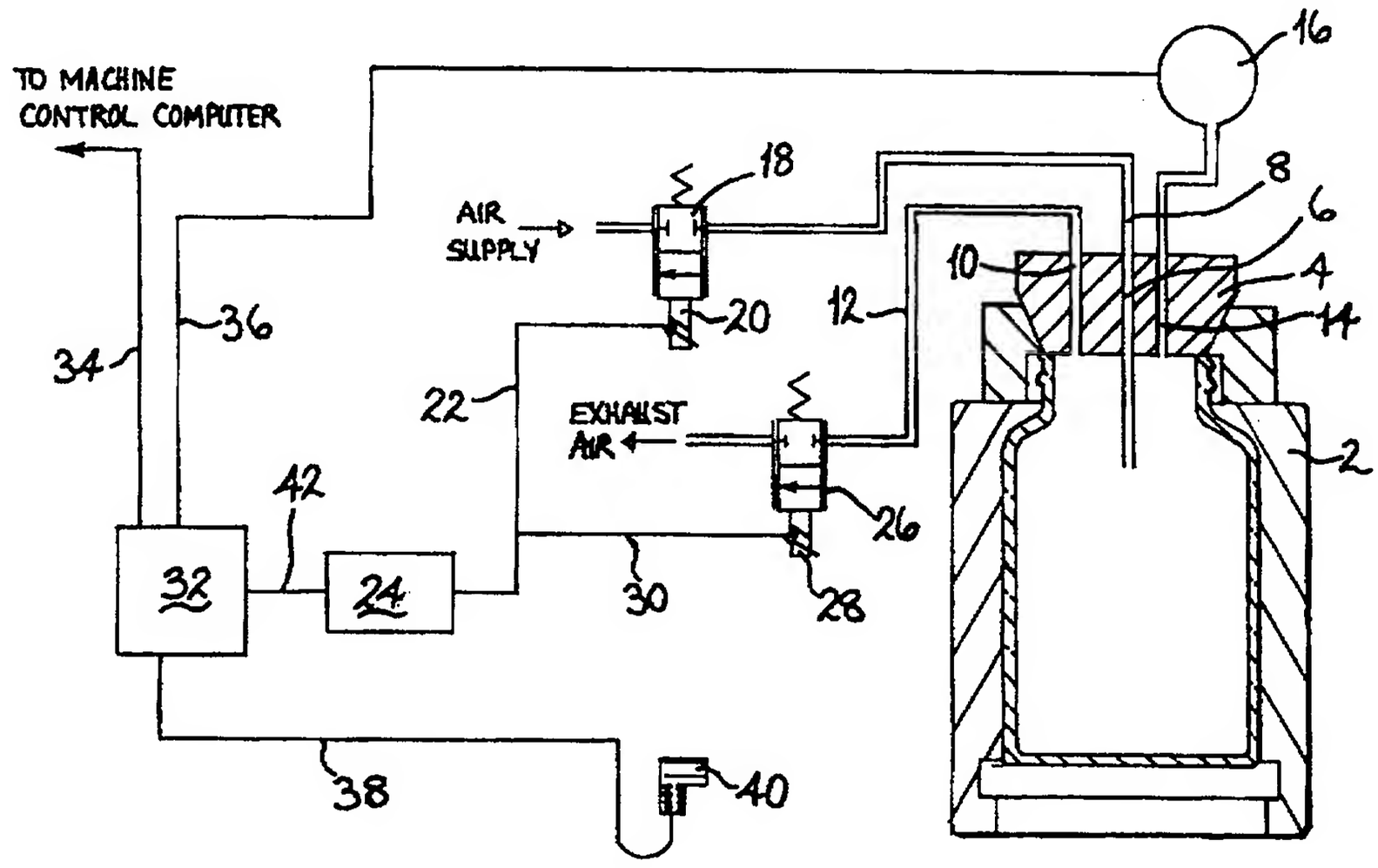
(58) Field of Search
UK CL (Edition N) **C1M MFT**
INT CL[6] **C03B 9/36**
On line : WPI

(54) Controlling air supply to glassware blow mould by computer

(57) Proportional valves 18, 26 in the inlet 8 and exhaust 10 passages of blowing air supplied to a blow mould 2 of an I.S glassware manufacturing machine are controlled by a computer 32 to obtain optimum conditions of supply of air to the mould to blow a container into its final form. The computer responds to pressure signals from the pressure sensor 16 measuring the air pressure in the mould.



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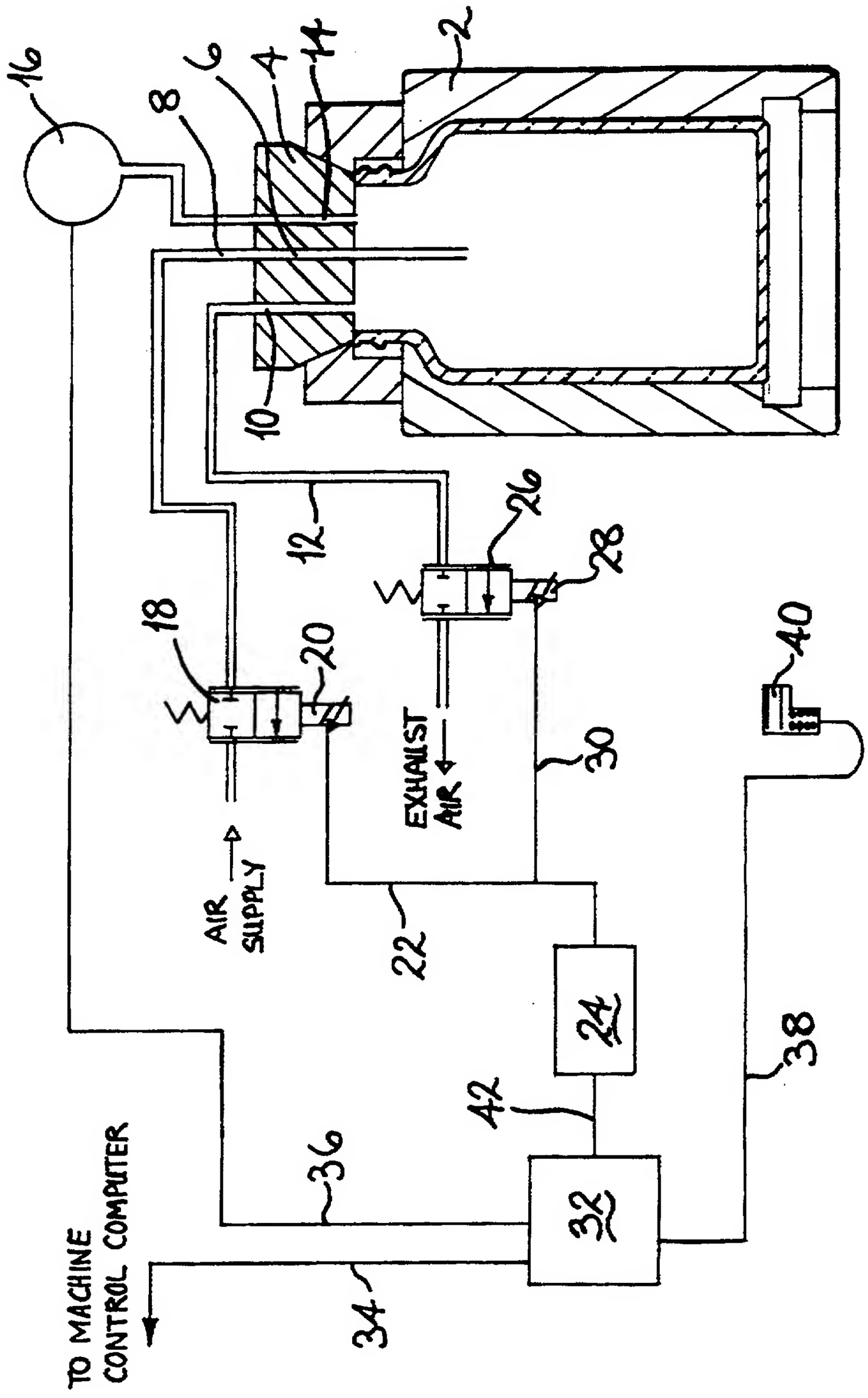
16
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EXHAUST AIR
AIR SUPPLY
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TO MACHINE CONTROL COMPUTER

This invention is concerned with the manufacture of glass hollow ware.

A common machine for use in the manufacture of glass hollow ware in the I.S machine, which machine comprises a series of identical sections arranged alongside each other and arranged to operate slightly out of place one with another so that a substantially continuous flow of formed glass hollow ware is provided.

The sequence of operations in a single section of an I.S machine is as follows:

1 A gob of glass is provided, from a feeder associated with the machine, into a parison mould

2 The glass is formed in the parison mould into a parison having its neck portion in contact with neck ring members of an invert mechanism

3 The parison mould opens and the formed parison is transferred by the invert mechanism to a blow station

4 Blow mould members close about the parison

5 A blow head descends to a position over the neck portion of the parison and blows air into the parison to blow it into a fully formed container in the blow mould members

6 A take out mechanism engages the neck portion of the hollow container, the blow moulds open, and the take out moves the blow container to a dead plate, at which it is cooled, and from which it is pushed out onto a conveyor by which it is carried to inspection and packing operation

The whcle operation of forming glass in a machine of this type is dependent on utilising the peculiar qualities of glass - its low conductivity and its lack of a specific

melting point - molten glass is in fact a super cooled liquid whose viscosity reduces as its temperature rises. Consequently, when a parison is formed, the outside of the parison is chilled by contact with the parison mould and forms a skin which has sufficient strength to maintain the shape of the parison as it is transferred from the parison mould to the blow mould. If the parison is then held without substantial external cooling, the parison reheats, that is to say heat passes from the interior of the parison to the outside of the parison so that it becomes flowable, thus permitting the parison to be successfully blown into a formed container.

When a parison is blown in the blow mould it is essential that it has been able to reheat to allow a good container to be formed. At the same time, after the container has been blown it is essential that the container is cooled to a shape retaining state so that it can be removed from the blow mould by the take out mechanism without risk of distortion.

The blowing operation is sometimes assisted by the application of vacuum to the blow mould, which assists in drawing the glass into contact with the inner surface of the mould. Cooling of the glass is effected partly by cooling of the blow moulds and partly by the air which is blown into the mould to form it.

Consequently consistently to provide satisfactory containers, that is containers which accurately conform to the mould and which are in a proper shape-retaining state when removed from the blow mould, it is necessary accurately to control the pressure, duration and amount of blown air which is supplied to the container. Normally this is set on

an ad hoc basis and is adjusted by the machine operator according to his experience.

It is an object of this invention to provide an effective means for controlling the pressure, amount and duration of the air supplied to blow a container in the blow mould of an I.S glassware forming machine.

The present invention provides an arrangement for controlling the supply of air to a blow mould in a glassware forming machine to blow a parison into a container comprising

a blow head adapted to engage the blow mould
a first passage in the blow head connected to a first pipe for the supply of air to the blow mould
a second passage in the blow head connected to a second pipe for the exhaust of air from the blow mould
means for sensing the pressure of the air in the blow mould
a first proportional valve in the first pipe
a second proportional valve in the second pipe
a valve controller adapted to control the two proportional valves
a computer arranged to receive
(i) timing signals from a machine control computer
(ii) pressure signals from the pressure sensor means and
(iii) input from a hand held terminal

to send command signals to the valve controller to provide for the desired operation of the two proportional valves

Figure 1 shows, diagrammatically, a blow mould of an I.S glassware forming machine and means for supplying blowing air to the blow mould.

A blow mould 2 is of conventional construction, and is mounted in a conventional mould opening and closing device (not shown). Mould cooling means (which may conveniently be of the axial type described in EP 102, 820) is also provided.

A blow head 4 is mounted to be positioned at an appropriate stage in the operation of the machine, over the blow mould 2 and is adapted to engage the blow mould. Three passages are provided in the blow head 4, a first passage 6 which is connected to a first pipe 8 for the supply of air to the blow mould from an air supply, a second passage 10 which is connected to a second pipe 12 which leads to exhaust and a third passage 14 which leads to a pressure sensor 16 for sensing the pressure of air in the blow mould 2.

A first proportional valve 18 is positioned in the pipe 8 between the air supply and the passage 6. It is operated by a solenoid 20 which is connected through a lead 22 to a valve controller 24.

A second proportional valve 26 is positioned in the pipe 12 between the passage 10 and the exhaust: the valve 26 is operated by a solenoid 28 which is connected through a lead 30 to the valve controller 24.

A digital computer 32 is connected by a lead 34 to a machine control computer from which it receives timing signals, by a lead 36 to the pressure sensor 16 from which it receives pressure signals, and by a lead 38 to a hand held terminal 40 from which it receives operator input. A lead 42 from the computer 32 to the valve controller 24

provides command signals to the valve controller to provide for the desired operation of the two proportional valves.

The arrangement for the supply of blowing air to the mould just described operates as follows. Timing and pressure information is automatically fed to the computer 32 through the leads 34 and 36. The operator feeds information, on an empirical basis, from the hand held terminal 40 through the lead 38 to the computer 32. On the basis of this information the computer calculates the desired timing and state of the two proportional valves 18 and 26 to give the desired blowing and cooling effect in the mould 2, and sends the appropriate command signals to the valve controller which transmits them to the valves. When a new container is being formed in the machine, the operator may have to adjust the settings of the hand held terminal to obtain the optimum conditions. However, once the settings for the optimum condition for a container of a particular size and weight have been determined, they may be recorded in the memory of the computer and utilised on future occasions where the same container is being manufactured.

The arrangement can be modified if desired. A less accurate control of the air can be obtained if only one of the proportional valves is used - preferably the valve 20 controlling the air supply. Further information can be supplied to the computer 32 - for example the temperatures of the inlet and exhausted air may be determined and factored into the control algorithm.

Use of the arrangement facilitates the consistent manufacture of satisfactory containers.

CLAIMS

1 An arrangement for controlling the supply of air to a blow mould in a glassware forming machine to blow a parison into a container comprising

a blow head adapted to engage the blow mould

a first passage in the blow head connected to a first pipe for the supply of air to the blow mould

a second passage in the blow head connected to a second pipe for the exhaust of air from the blow mould

means for sensing the pressure of the air in the blow mould

a first proportional valve in the first pipe

a second proportional valve in the second pipe

a valve controller adapted to control the two proportional valves

a computer arranged to receive

(i) timing signals from a machine control computer

(ii) pressure signals from the pressure sensor means and

(iii) input from a hand held terminal

to send command signals to the valve controller to provide for the desired operation of the two proportional valves

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Patents Act 1977 **Examiner's report to the Comptroller under Section 17** **(The Search report)**	Application number GB 9501228.2
Relevant Technical Fields (i) UK Cl (Ed.N) C1M (MFT) (ii) Int Cl (Ed.6) C03B 9/36	Search Examiner C A CLARKE
	Date of completion of Search 8 MARCH 1995
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE: WPI	Documents considered relevant following a search in respect of Claims :- 1

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
A	DERWENT WPI 92-352913/43 & JP 040254423 (NIPPON ELECTRIC GLASS)	

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).